

DOE RIVER BRIDGE  
(Elizabethton Bridge)  
National Covered Bridges Recording Project  
Spanning Doe River, Third Avenue  
Elizabethton  
Carter County  
Tennessee

HAER No. TN-41

PHOTOGRAPHS

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WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD

National Park Service  
U.S. Department of the Interior  
1849 C St. NW  
Washington, DC 20240

## HISTORIC AMERICAN ENGINEERING RECORD

### DOE RIVER BRIDGE (Elizabethton Bridge) HAER No. TN-41

LOCATION: Spanning Doe River at Third Avenue, Elizabethton, Carter County,  
Tennessee  
UTM: 17.391247.4023153, Elizabethton, Tennessee Quadrangle

STRUCTURAL  
TYPE: Howe truss covered bridge

DATE OF  
CONSTRUCTION: 1882-1884

GENERAL  
CONTRACTOR: E.E. Hunter

SUPERVISING  
ENGINEER: Thomas E. Matson

BUILDERS: A.T. Johnson, George Perry and Michael Lindamood

PRESENT OWNER: Elizabethton, Tennessee

PREVIOUS USE: Vehicular bridge

PRESENT USE: Vehicular bridge

SIGNIFICANCE: The Doe River Bridge played an integral role in the historical development of the City of Elizabethton and is of interest as one of only a few covered bridges in the United States that survives in an urban setting. The Howe truss, patented in 1840, was the first truss type to use metal for primary structural members, and it dominated American bridge building in the mid-nineteenth century. The original contract documents specified the hip roof design, which resembles European covered bridges but is unique to the United States.

HISTORIAN: Researched and written by Lola Bennett, March 2003

PROJECT  
INFORMATION: The National Covered Bridges Recording Project is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering and industrial works in the United States. HAER is administered by the Historic American Buildings

Survey/Historic American Engineering Record, a division of the National Park Service, U.S. Department of the Interior. The Federal Highway Administration funded the project.

For additional information, see HABS No. TN-224, Elizabethton Covered Bridge.

## **Chronology**

- 1882 Carter County Court orders a bridge constructed over Doe River at Elizabethton
- 1883 Doe River Bridge completed
- 1884 Doe River Bridge covered with a roof and siding
- 1901 Doe River Bridge survives “Big Tide” of May 1901
- 1907 “Doe River Wagon Bridge” undergoes minor repairs costing \$100
- 1926 Carter County turns over maintenance of bridge to City of Elizabethton
- 1938 Doe River Bridge roof replaced prior to this date
- 1958 Doe River Bridge repaired and painted.
- 1964 Doe River Bridge undergoes flood repairs (H.T. Spoden, engineer)
- 1965 Elizabethton Covered Bridge recorded by the Historic American Buildings Survey
- 1972 Doe River Bridge rehabilitation (H.T. Spoden, engineer)
- 1973 Elizabethton Historic District listed on the National Register of Historic Places
- 1986 Directional and historical signs installed
- 1993 Metal roof replaced with wood shingles
- 2002 City of Elizabethton receives grant for rehabilitation of covered bridge
- 2003 Doe River Bridge recorded by the Historic American Engineering Record
- 2003 Doe River Bridge undergoes rehabilitation

## Description

The Doe River Bridge is a single-span Howe truss wood covered bridge on mortared stone masonry abutments. The total length of the bridge is 154'-0", with a clear span of 137'-0" feet. The truss is 16' high from the top of the upper chord to the bottom of the lower chord and 17'-0" wide between the trusses and 20'-3" wide overall.

The trusses are framed in the manner patented by William Howe in 1840. The upper chords are composed of three lines of timbers (one 8"x12" large timber flanked by 5"x8" timbers), bolted together, with shear blocks between the timbers. The lower chord is composed of four lines of timbers with shear blocks, bolted together. The chords are connected by paired diagonal 8"x8" timbers and single 5"x7" counter diagonals within each panel, and paired 1-1/8" diameter vertical iron rods at each panel point. There are groups of six 7"x8" vertical end posts and two 1" diameter rods at each corner. The upper and lower connections at each panel point incorporate triangular cast iron bearing block assemblies, with seats for the diagonal timbers and openings for the metal rods to pass through. Each rod passes through this assembly and through the chord, where it is fastened on the far side with a plate and nut.

The deck system is composed of 4"x12" transverse deck beams seated on the lower chord 1'-9" apart. The lower chords rest on bed timbers on top of the abutments. Lower lateral bracing crosses between the panel points below the deck beams. Longitudinal plank decking is laid directly on the deck beams; there are no stringers. Steel wearing plates have been installed along the deck. The bridge originally carried traffic in both directions, but presently carries one-way traffic to allow for a pedestrian walkway inside the bridge.

The upper lateral system is composed of transverse metal tie rods between the upper chords at each panel point and lateral timber bracing crossing overhead between the panel points. Pigeon netting has been installed along the length of the bridge. There are wood sway braces between the tie beams and end posts. Wood rafters, spaced approximately 2' apart, rest on the upper chord and angle upward to frame the roof. The hip roof is covered with wood shingles fastened to wood purlins on top of the rafters. The roof overhangs the structure by about 1', and the rafter tails are exposed at the eaves.

The exterior of the bridge is covered with clapboards to the eaves. The sheathing is fastened to vertical nailers on the exterior faces of the trusses. The portals have square openings and angle forward about 6' over the approaches. There are two arched window openings on each side of the bridge.

## Tennessee Covered Bridges

The date of Tennessee's first covered bridge has not been determined, but a double-barrel Burr arch bridge built at Ringgold in 1856 is among the oldest.<sup>1</sup> Historians estimate that Tennessee

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<sup>1</sup> Richard Sanders Allen, *Covered Bridges of the South* (New York: Bonanza Books, 1970), p.29.

once had about 200 covered bridges. Over time, however, these bridges fell victim to floods, fires, decay or progress. By the mid-1940s, only a dozen covered bridges remained in the state.<sup>2</sup> Today, the Doe River Bridge is one of three surviving covered bridges in Tennessee, the others being Harrisburg Bridge (1875) in Sevier County and Bible Bridge (1922) in Greene County.<sup>3</sup>

## History of Bridge and Site

Tennessee territory was a wilderness when “Elizabethtown” was settled in the late eighteenth century. By the 1830s, Elizabethton’s population had grown to 176, and the village boasted “one academy, one church, one lawyer, two doctors, two blacksmiths, one cabinet maker, two carpenters, two hatters, three stores, two shoemakers, one saddler, three tailors, one tinner, one grist mill and one set of iron works.”<sup>4</sup> As the county seat of Carter County, Elizabethton’s population doubled in the second half of the nineteenth century, increasing from 6,296 in 1850 to 13,389 in 1890.<sup>5</sup> Yet, physical expansion was difficult due to the town’s geography, as the site lay between Lynn Mountain on the east, the Watauga River on the north and the Doe River on the south.

There was a ford at, or near, the bridge’s location in the mid-nineteenth century, but frequent floods made crossing the river unpredictable and hazardous, and by the 1860s the community began discussing potential sites for a bridge on Doe River.<sup>6</sup> Nothing was done, however, until 1881, when the East Tennessee & Western North Carolina Railroad (ET&WNCRR) completed a railroad line from Johnson City, Tennessee, to Cranberry, North Carolina, and constructed a depot on the north side of the river at Elizabethton.

In January 1882 the Carter County Court ordered an appropriation of \$1,500 for a bridge “across Doe River leading to the depot of the ET&WNCRR” and a second appropriation of \$1,500 for a bridge “across Watauga River near Elizabethton.” A committee was appointed to locate the crossings, and railroad engineer Col. Thomas E. Matson supervised the work.<sup>7</sup> In April 1882, the committee reported “that it is impracticable to construct a bridge at all across the Watauga River” and recommended using the total appropriation for a single bridge across Doe River. The county court authorized the transfer of funds and appointed a committee to oversee construction of the bridge.<sup>8</sup>

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<sup>2</sup> Ursula Smith Beach, “Tennessee’s Covered Bridges, Past and Present,” *Tennessee Historical Quarterly* 28 (Spring–Winter 1969), p.14.

<sup>3</sup> This number does not include stringer bridges with housings, or the reconstructed covered bridge (1977) at Port Royal.

<sup>4</sup> Eastin Morris, *Tennessee Gazetteer* (Nashville: W. Hasell Hunt & Company, 1834).

<sup>5</sup> Frank Merritt, *Later History of Carter County* (Kingsport, Tennessee: Arcola Graphics, 1986), p.422.

<sup>6</sup> Dan Crowe, *Old Town and the Covered Bridge* (Johnson City, Tennessee: Milligan Press, 1977), p.2.

<sup>7</sup> Col. Thomas E. Matson was the civil engineer who supervised construction of the railroad through Elizabethton.

<sup>8</sup> *Carter County Court Records*, Book 1, 1866-1889, p.311

A local carpentry crew consisting of A.T. Johnson, George Perry and Michael Lindamood constructed the Doe River Bridge in the summer of 1882.<sup>9</sup> Elizabethton physician and businessman E.E. Hunter served as financier and general contractor.<sup>10</sup> In January 1883, the county court authorized a contract for completion of the approaches to the bridge. One year later, the county court laid out specifications for weatherboarding and painting the bridge. The roof was to be “hipped at each end” and covered with chestnut shingles, and the siding was to be yellow poplar clapboards “with 1¼ inch lap.”<sup>11</sup>

The Doe River Bridge has served the community of Elizabethton for well over a century. It was the only vehicular bridge in Elizabethton until the 1920s, when a concrete arch bridge was constructed at Elk Avenue.<sup>12</sup> In 1926, Carter County and the City of Elizabethton agreed to share the expense of repairing the covered bridge, “on condition that the City pay the other one half of expense of said repair bill and hereafter take charge of the bridge.” Since that time, the City of Elizabethton has maintained the bridge.

In 1973 the Doe River Bridge was listed on the National Register of Historic Places as a contributing structure to the Elizabethton Historic District. The bridge remains essentially intact, although it has been repaired on numerous occasions. A standing seam metal roof replaced the original cedar shingle roof sometime prior to 1938, and the present wood shingle roof replaced that roof in 1993. In 1972 the covered bridge was declared unsafe and underwent substantial repairs costing \$36,000. In 2003, the Doe River Bridge was rehabilitated under a Transportation Enhancement Grant from the Federal Highway Administration.

### **William Howe and the Howe Truss**

In 1840, Massachusetts millwright William Howe (1803-1852) patented a bridge truss with parallel upper and lower chords connected by wooden diagonals in compression and iron verticals in tension. First to incorporate iron for primary structural members, the Howe truss improved on Col. Stephen H. Long’s 1830 truss design by replacing the vertical wood members with adjustable wrought iron rods to overcome the inherent difficulty of creating tension connections in wood structures and allow for easier and more efficient prestressing of the members. The Howe truss subsequently became the dominant truss form in the period of transition from wood to iron, and was used extensively for railroad bridges in the United States and Europe during the mid-nineteenth century.

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<sup>9</sup> *Elizabethton Star*, November 12, 1939. Presumably, this information was gathered from local residents who could still recall the bridge’s construction. The *Elizabethton Mountaineer*, mentioned in late nineteenth century county court records, was not found in a search of local repositories.

<sup>10</sup> *Elizabethton Star*, November 12, 1939. Local businessman, physician and pharmacist Dr. E.E. Hunter (1845-1918) is often credited with the construction of Doe River Bridge, but documentary evidence indicates that he served as a general contractor for the project, overseeing the financial and legal aspects, rather than being the actual builder of the structure.

<sup>11</sup> A copy of these specifications was provided to the City of Elizabethton Planning and Development Department for use in the upcoming rehabilitation of the bridge.

<sup>12</sup> There was a footbridge at Elk Avenue in the 1890s, but the Doe River Bridge was the only vehicular bridge across the river at Elizabethton.

In the late nineteenth century, the Pratt truss, patented in 1844, gradually overtook the popularity of the Howe truss. The Pratt truss, a direct reversal of the Howe truss, featured wooden verticals in compression and iron diagonals in tension and was preferred for its use of shorter compression members, which were less expensive to fabricate and greatly reduced the chance of lateral buckling in the members.<sup>13</sup>

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<sup>13</sup> Carl Condit, *American Building Art: Nineteenth Century* (New York: Oxford University Press), p.110.



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